

BAB V

PERHITUNGAN BALOK B4

5.1 Properties Balok B4

Data - data : $b := 150 \text{ mm}$ Tulangan utama D13 mm
 $h := 400 \text{ mm}$
 $d := h - (40 + 8 + 0.5 \cdot 13) = 345.5 \text{ mm}$
 $d_{aksen} := h - d = 54.5 \text{ mm}$
 $f_c := 18.675 \text{ Mpa}$ $\beta := 0.85$
 $f_y := 390 \text{ Mpa}$

$$\rho_b := 0.85 \cdot \beta \cdot \frac{f_c}{f_y} \cdot \left(\frac{600}{600 + f_y} \right) = 0.02$$

$$\rho_{max} := 0.75 \rho_b = 0.016$$

$$\rho_{min} := \frac{1.4}{f_y} = 0.0036$$

$$m := \frac{f_y}{0.85 \cdot f_c} = 24.57$$

Dari output ETABS didapat :

Mutump := 13.0529 kNm

Mulap := 12.8994 kNm

5.2 Perhitungan Tulangan Lentur Tumpuan

ambil $\delta := 0.4$

$$M_n := \frac{\text{Mutump} \cdot 10^6}{0.8} = 16316125 \text{ Nmm}$$

$$R_n := \frac{(1 - \delta) M_n}{b \cdot d^2} = 0.547 \text{ N/mm}^2$$

$$(\rho - \rho_{aksen}) := \frac{\left(1 - \sqrt{1 - \frac{2m \cdot R_n}{f_y}} \right)}{m} = 0.0014$$

$$\rho_{aksen} := \frac{\delta \cdot M_n}{f_y \cdot (d - d_{aksen}) \cdot b \cdot d} = 0.0011$$

$$\rho := 0.0014 + 0.0011 = 0.0025 < \rho_{min} = 0.0036$$

$$A_{sperlu} := \rho_{min} \cdot b \cdot d = 186.04 \text{ mm}^2$$

$$A_s := 0.785 \cdot 13^2 \cdot 4 = 530.7 \text{ mm}^2$$

$$s1 := \frac{(150 - 80 - 16 - 2 \cdot 13)}{2 - 1} = 28 \text{ mm} \quad \blacksquare > \blacksquare \quad 25 \text{ mm} \quad \text{OK!!}$$

$$A_{s_{\text{aksenperlu}}} := \rho_{\text{aksen}} \cdot b \cdot d = 57.51 \text{ mm}^2$$

$$A_{st} := 0.785 \cdot 13^2 \cdot 2 = 265.33 \text{ mm}^2$$

pasang tul tarik 4D13 dan tulangan tekan 2D13

5.3 Perhitungan Tulangan Lentur Lapangan

$$\text{ambil } \delta := 0.4$$

$$M_n := \frac{M_{\text{lap}} \cdot 10^6}{0.8} = 16124250 \text{ Nmm}$$

$$R_n := \frac{(1 - \delta) M_n}{b \cdot d^2} = 0.54 \text{ N/mm}^2$$

$$(\rho - \rho_{\text{aksen}}) := \frac{\left(1 - \sqrt{1 - \frac{2m \cdot R_n}{f_y}}\right)}{m} = 0.0014$$

$$\rho_{\text{aksen}} := \frac{\delta \cdot M_n}{f_y \cdot (d - d_{\text{aksen}}) \cdot b \cdot d} = 0.0011$$

$$\rho := 0.0014 + 0.0011 = 0.0025 \quad \blacksquare < \blacksquare \quad \rho_{\text{min}} = 0.0036$$

$$A_{s_{\text{perlu}}} := \rho_{\text{min}} \cdot b \cdot d = 186.04 \text{ mm}^2$$

$$A_s := 0.785 \cdot 13^2 \cdot 4 = 530.7 \text{ mm}^2$$

$$s1 := \frac{(150 - 80 - 16 - 2 \cdot 13)}{2 - 1} = 28 \text{ mm} \quad \blacksquare > \blacksquare \quad 25 \text{ mm} \quad \text{OK!!}$$

$$A_{s_{\text{aksenperlu}}} := \rho_{\text{aksen}} \cdot b \cdot d = 56.83 \text{ mm}^2$$

$$A_{st} := 0.785 \cdot 13^2 \cdot 2 = 265.33 \text{ mm}^2$$

pasang tul tarik 4D13 dan tulangan tekan 2D13

5.4 Perhitungan Tulangan Geser Balok

$$V_c := \frac{\sqrt{f_c} \cdot b \cdot d}{6} = 37326.59 \text{ N}$$

$$V_u := 21013 \text{ N}$$

$$V_c = 37326.59 \text{ N}$$

$$V_s := \frac{V_u}{0.75} - V_c = -9309.26 \text{ N} \quad \text{Perlu tulangan geser !!}$$

$$V_{s_{\text{min}}} := \frac{b \cdot d}{3} = 17275 \text{ N}$$

Bila dipasang tulangan $\Phi 8$ sebagai sengkang, $A_v := 2 \cdot 0.785 \cdot 8^2 = 100.48 \text{ mm}^2$

$f_y := 240 \text{ Mpa}$

$$s_v := \frac{A_v \cdot f_y \cdot d}{V_{smin}} = 482.3 \text{ mm}$$

sehingga dipakai tulangan geser tumpuan $\phi 8 - 150$ dan lapangan $\phi 8 - 200$